

Salad Greens

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Dole Fresh Vegetables, Salinas, CA

Scientific Names and Introduction: Various greens other than lettuces are used in raw salads. These include, but are not limited to: corn salad; lamb's lettuce; field salad; mâche *Valerianella locusta* (L.) Latterrade em. Betcke (*V. olitoria*); dandelion *Taraxacum officinale* Wiggers; French or round sorrel *Rumex scutatus*; Garden sorrel *R. acetosa* L; Miner's lettuce; Winter purslane; claytonia *Montia perfoliata* (*Claytonia perfoliata*); Mizuna *Brassica rapa* L. subsp. *japonica* (Group Japonica); purslane *Portulaca oleracea* L.; and Rocket salad, roquette, arugula, rucola, rugula *Eruca vesicaria* (L.) Cav. subsp. *sativa* (Mill.) Thell. Young leaves are generally used. For other salad vegetables, see watercress, chicory, beet greens, chard, kale, mustard and turnip greens, and Asian brassicas such as red Chinese mustard, tat soi, and napa cabbage.

Quality Characteristics and Criteria: Greens used in raw salads must be fresh, tender and turgid, with no yellowing, decay, or insect or mechanical damage. Whole plants of rocket and lamb's lettuce are sometimes sold with roots attached, which lengthens postharvest life.

Horticultural Maturity Indices: Greens are harvested as individual leaves, leaf clusters, or whole plants and should be young, tender and mild flavored. Plants that have flowered are usually too strong in flavor and tough in texture for use in raw salads.

Grades, Sizes and Packaging: These crops are not graded or sized in the U.S. Salad greens may be packed in fiberboard cartons lined with perforated polyethylene bags, small sealed plastic bags, trays or clamshell containers. These greens may also be packed as bunches of leaves or plants (Rubatzky and Yamaguchi, 1997; Péron and Rees, 1998).

Pre-Cooling Conditions: Greens for salads should be cooled to 0 °C (32 °F) as soon as possible after harvest. Vacuum-cooling is effective for removing field heat.

Optimum Storage Conditions: Salad greens should be stored at 0 to 2 °C (32 to 36 °F) with 95 to 100% RH. Rocket salad typically lasts 7 to 10 days and other leafy greens 10 to 14 days (Cantwell, 1997). Top icing can be used.

Controlled Atmosphere (CA) Considerations: CA is generally not beneficial. MAP is mostly beneficial for controlling RH. However, lamb's lettuce retains acceptable quality after 28 days in sealed plastic bags with reduced O₂ and elevated CO₂ at < 4 °C (39 °F) (Leiris, 1987). MAP of sorrel reduces yellowing and decay (Aharoni et al., 1993).

Retail Outlet Display Considerations: Use of water sprinklers is acceptable. Leafy greens are highly susceptible to water loss and wilting.

Chilling Sensitivity: Salad greens are not sensitive to chilling and should be stored as cold as possible without freezing.

Ethylene Production and Sensitivity: Salad greens have very low ethylene production, but are highly sensitive to ethylene exposure (Cantwell, 1997), which typically results in loss of chlorophyll leading to yellowing of leaves.

Respiration Rates:

Temperature	Rocket salad	Lamb's lettuce
	(mg CO ₂ kg ⁻¹ h ⁻¹)	
0 °C	42	12
5 °C	113	-
7 °C	-	67
10 °C	-	81
20 °C	-	139

To get mL kg⁻¹ h⁻¹, divide the mg kg⁻¹ h⁻¹ rate by 2.0 at 0 °C (32 °F), 1.9 at 10 °C (50 °F), and 1.8 at 20 °C (68 °F). To calculate heat production, multiply mg kg⁻¹ h⁻¹ by 220 to get BTU per ton per day or by 61 to get kcal per metric ton per day. Data are from Cantwell and Reid (1993), Cantwell (1997), Peiris et al. (1997), Rubatzky and Yamaguchi (1997), and Piergiovanni et al. (1999). Respiration rates for other greens are not reported, but would be expected to be similar.

Physiological Disorders: Due to the delicate texture of the leaves, they are highly susceptible to mechanical damage, which may result in discoloration and decay.

Postharvest Pathology: Low temperatures must be maintained throughout the cold chain to minimize pathological disorders and prolong shelf-life. Salad greens are typically susceptible to the same bacterial soft rot and fungal decay as lettuce.

Quarantine Issues: None.

Suitability as Fresh-cut Product: Intact leaves are sometimes included in packaged salad mixes.

Special Considerations: They must be handled carefully to avoid mechanical damage and water loss.

References:

- Aharoni, N., O. Dvir, D. Chalupowicz and Z. Aharon. 1993. Coping with postharvest physiology of fresh culinary herbs. *Acta Hort.* 344:69-78.
- Cantwell, M. 1997. Properties and recommended conditions for storage of fresh fruits and vegetables. <http://postharvest.ucdavis.edu>.
- Cantwell, M.I. and M.S. Reid. 1993. Postharvest physiology and handling of fresh culinary herbs. *J. Herbs Spices Medicinal Plants* 1:83-127.
- de Leiris, J. 1987. The packaging of fresh vegetables in barrier films and modified atmospheres. In: *Proc. 1st Intl Conf. Pack. Adv., Nova-Pack, Dusseldorf, Germany*, pp. 135-162.
- Peiris, K.H.S., J.L. Mallon and S. J. Kays. 1997. Respiratory rate and vital heat of some specialty vegetables at various storage temperatures. *HorTechnology* 7: 46-49.
- Péron, J.Y. and D.C. Rees. 1998. High-tech production of corn salad (*Valerianella locusta* (L.) Laterr.), a local, French vegetable crop. *Acta Hort.* 467:259-268.
- Piergiovanni, L., P. Fava and S. Ceriani. 1999. A simplified procedure to determine the respiration rate of minimally processed vegetables in flexible permeable packaging. *Ital. J. Food Sci.* 11:99-110.
- Rubatzky, V.E. and M. Yamaguchi. 1997. *World vegetables: principles, production and nutritive values*. Chapman and Hall, London.